REMARKS

This is a replacement response submitted to address the deficiencies noted in the Advisory Action of January 26, 2006. Applicant respectfully requests that the Examiner enter this replacement response in lieu of the response submitted on November 1, 2005.

Claims 1-10 and 12-28 are presently pending. Claim 11 has been canceled. Claim 26 has been amended. Claims 2-5, 7, 10, 16-25, 27 and 28 have been withdrawn from consideration as directed to a non-elected invention.

The Examiner has indicated that claims 1, 2, and 7 are allowed.

Applicant respectfully requests reconsideration of the application in view of the foregoing amendments and the remarks appearing below, which Applicant believes places the application in condition for allowance.

Objection to Specification

The Examiner has objected to the specification as failing to provide proper antecedent basis for the claimed subject matter. In particular, the Examiner states that there is no clear antecedent basis for the expression "real space" in claim 26.

Applicant has amended claim 26 so as to change the term "real space" to "free space," which the Examiner appears to suggest as an unobjectionable replacement. Therefore, Applicant respectfully requests that the Examiner withdraw the present objection.

Objection to Claims

The Examiner has objected to claim 26, and claims 6, 8, 9, and 12-15 that depend therefrom, as containing an informality. More particularly, the Examiner states that the expression "real space" appearing in claim 26 does not find any clear meaning in the disclosure.

As mentioned in the immediately preceding section, Applicant has amended claim 26 so as to change the term "real space" to "free space," which the Examiner appears to suggest as an unobjectionable replacement. Therefore, Applicant respectfully requests that the Examiner withdraw the present objection.

Rejections under 35 U.S.C. § 103

Tanaka et al. and Hoppe or, alternatively, Tanaka et al., Hoppe and Broer et al.)

The Examiner has rejected claims 6, 8, 9, 12-15, and 26 under 35 U.S.C. § 103 as being obvious in view of the Tanaka et al. and Hoppe patents or, alternatively, the Tanaka et al. and Hoppe patents further in view of the Broer et al. reference, stating that Tanaka et al. disclose all of the limitations of these claims except for a broadband reflector-polarizer. The Examiner then states that Hoppe or, alternatively, Hoppe and Broer et al. disclose the missing limitation and asserts that it would have been obvious to a person having ordinary skill in the art at the time of the invention to provide the Tanaka et al. optical system with a broadband reflector-polarizer as disclosed by Hoppe or Hoppe and Broer et al. Applicant respectfully disagrees.

The disclosures of Tanaka et al, Hoppe, and Broer et al. are as discussed in the Response filed June 17, 2005.

The Examiner argues in connection with this rejection that "[w]hile it is true that the system of Tanaka, et al [sic] having the corrective optics is *for* projecting a real image *on a screen*, the real image is floating in time as a screen is erected at the location of the projected real image [i.e., the Tanaka et al. system] inherently produces an image floating in real space until the projector is located in front of a wall, screen, or other projection surface." Office Action, at 8-9 (emphasis in original). Applicant respectfully disagrees.

As disclosed in detail in the present application, an aspect of the present invention is directed to forming floating real images in free space, i.e., images that are perceptible by human observers and appear to observers to be floating in free space. A critical aspect of such floating images is that the observers perceive them to be independently self-sustaining, with no enabling intervening physical construct, such as a screen, in the vicinity of the images to make them readily perceptible to the observers. Another important aspect is that the floating images of the present invention are capable of including both 2-dimensional and 3-dimensional qualities, whereas images that require a screen in order to be perceived are inherently limited to a 2-dimensional nature.

Without the presence of the screen, the set of light rays present in a plane where a projection screen must be for an observer to perceive the projected image from a conventional

projector (such as the Tanaka et al. projector) does not form a perceivable and effective floating image. Such conventional projectors are designed to produce large 2D images from small sources. Their design is based on the expectation that a screen will always be present at the image to diffuse the consequently small numerical aperture of the image cone into a large usable image cone for perceptibility by observers. Such projectors are designed for applications such as cinema, in which a tiny numerical aperture of the imaging beam impinging on the screen is not only acceptable, but may be regarded as a desirable feature that allows high magnification of 2D images. Such small numerical apertures are incompatible with floating images.

In contrast, projectors designed to create floating images, such as those described for the present invention, necessarily require a substantially large numerical aperture at the image, to insure that the image may be seen by both the observer's eyes over a large viewing cone angle, without the assistance of a diffusing mechanism. Such projectors are of an inherently different class than conventional projectors (such as the Tanaka et al. projector), and their design principles regarding numerical aperture are inherently antithetical.

In other words, the Tanaka et al. projector does not form usable real images without the presence of projection screen. Therefore, the Tanaka et al. projector, in fact, does not produce floating real images in free space as the Examiner asserts. Since claim 26, and each of claims 6, 8, 9, and 12-15 that depend therefrom require an optical system that forms floating real images in free space, and none of the Tanaka et al., Hoppe, and Broer et al. references disclose or suggest such an optical system, the applied combination cannot render these claims obvious.

Turning to the distinction between a floating real image in free space and an image projected onto a projection screen in more detail, it is improper to attempt to equate a real image floating in space, which the human eyes can perceive directly, with the two-dimensional image that a projection surface recreates for secondary perception by the eyes. This is so because without the screen, there is no perceivable image where the screen would otherwise be.

The difference resides in the fact that the screen captures and freezes (e.g., by reflection or transmission) all rays of light that fall in that exact two-dimensional plane, regardless of the path each ray traversed in order to arrive at their exact position in that plane. The screen then diffuses each and every one of those rays to some degree, spreading the image light from each

into a cone, with the screen acting as a new image source that is essentially two-dimensional. In this sense, this is essentially the same as two-dimensional photography, albeit with potentially rapidly varying images. The result is century-old cinema and TV.

The confluence of rays that form a real image floating in space without the presence of a screen, however, is an entirely different matter. A pair of human eyes can readily perceive depth information in the focus of rays both in front of and behind nominal intermediate location when there is no screen present, and points in the image formed by that focus are accordingly perceived as being located in front of or behind that location, as well as in their two-dimensional height and width location.

When a screen is placed at the nominal intermediate location of a floating real image of the present invention, this information is intercepted by the screen and the depth information is lost in the resulting two-dimensional blur on the screen that results from rays that focus in depth either before or after the screen location. With a screen at the nominal location, however, all image imperfections from each and every ray are captured, frozen, and reproduced simultaneously. Such coarse two-dimensional images caused by the insertion of a screen would be completely unacceptable in the context of a system of the present invention.

Lest the Examiner assert that even though the Tanaka et al. projector does not form a perceivable real image floating in space when a screen is not present, it nevertheless forms some sort of "image" in space, Applicant respectfully submits that the term "real image" as used in the present claims and in the present application inherently includes the concept that the image is capable of being directly visually perceived by a viewer. Indeed, the plain and ordinary meaning of the word "image," as understood by both skilled artisans and lay people alike in the field of optics, is that an image is, by definition, something that is visually perceivable. This is not true of the set of light rays present in a plane where a screen would otherwise be present in a conventional projection system, such as the Tanaka et al. system.

In addition, Applicant notes that in construing claim terminology, the U.S. Patent and Trademark Office affords claim terminology its broadest reasonable interpretation that is "consistent with the interpretation that those skilled in the art would reach." MPEP § 2111 (*citing* In re Cartright, 165 F.3d 1353, 1359, 49 USPQ2d 1464, 1468 (Fed. Cir. 1999)). Thus, an

examiner is not free to simply apply the broadest interpretation of claim terminology, but rather the examiner must adjust the breadth of the terminology to the breadth that those skilled in the art would give the terminology "taking into account whatever enlightenment by way of definition or otherwise that may be afforded by the written description contained in the applicant's specification." Id. (*citing* In re Morris, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027-28 (Fed. Cir. 1997) [emphasis added]). In the present case, Applicant respectfully asserts that a skilled artisan, having read and understood the present application, would indeed understand that the term "real image" is an image directly visually perceptible to a viewer.

Moreover, to assert that the Tanaka et al. and/or Hoppe systems could be modified so as to form a real floating image would be to destroy the functionality of these systems, which are each intended to be either a virtual image system or a screen-type projecting system that are both much different from the real floating image forming system of claims 6, 8, 12-15, and 26. Consequently, those skilled in the art would not be motivated to make the modifications to the Tanaka et al., Hoppe and/or Broer et al. systems necessary to create an optical system that forms a real floating image in free space.

For at least the foregoing reasons, Applicant respectfully requests that the Examiner withdraw the present rejection.

Conclusion

In view of the foregoing, Applicants respectfully submit that claims 1-16 and 26-28, as amended, are in condition for allowance. Therefore, prompt issuance of a Notice of Allowance is respectfully solicited. If any issues remain, the Examiner is encouraged to call the undersigned attorney at the number listed below.

Respectfully submitted,

BRUCE D. DIKE

By: _____

Morgan S. Heller II
Registration No.: 44,756
Downs Rachlin Martin PLLC
Tel: (802) 863-2375

Attorneys for Applicant

BTV.458027.4